Updating Transportation Metrics

Chris Ganson
Governor’s Office of Planning and Research

1. What do we want from transportation?
2. Problems with automobility-focused planning
3. Distinguishing performance measures and measures of impact
4. Greenhouse gas emissions reduction
5. Problems with using LOS in CEQA
6. SB 743 and the shift to VMT
7. Caltrans role in implementing SB 743
8. Questions/Discussion

What do we *really* want from transportation?

What we want from transportation

- **Mobility**

What we want from transportation

- **Access to destinations**

What we want from transportation

- **Access to destinations**
  - **Economic opportunity**
  - **Social opportunity**

What we want from transportation

- Access to destinations:

Mobility

and

Proximity

What we want from transportation

- Access to destinations:

Mobility

- **Speed**
- **Delay**
- **TTI Index**

and

Proximity

- Distance
- Stores per square mile
- Intersections per square mile

What we want from transportation

- Access to destinations:

Mobility

- Speed
- Delay
- TTI Index

and

Proximity

- **Distance**
- **Stores per square mile**
- **Jobs within 10 miles**

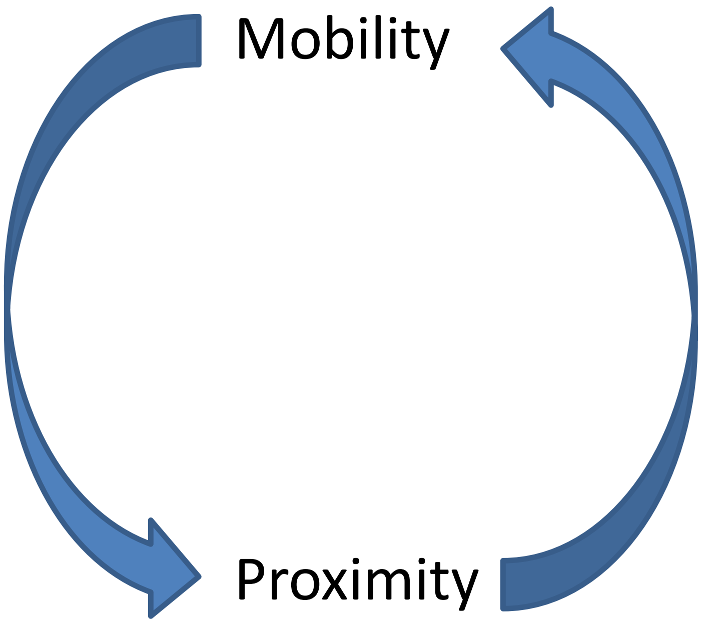
What we want from transportation

Metrics of **access to destinations**

- **Time to destination**
- **Number of jobs reachable within 20 minute drive**
- **Number of stores reachable within 10 minute walk**
- **Walkscore**

Problems with mobility-focused planning

Problems with mobility-focused planning



Problems with mobility-focused planning

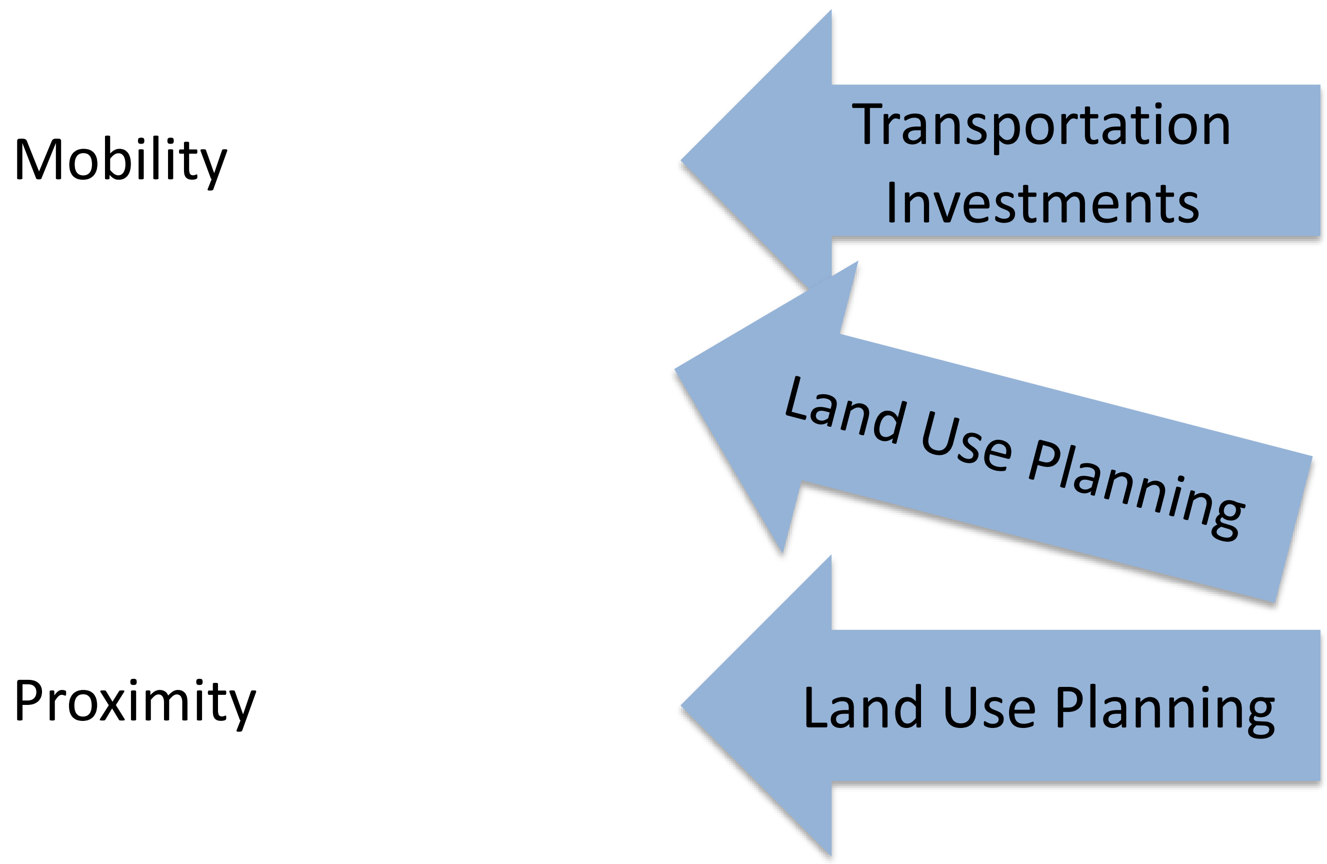
Mobility

Transportation Investments

Proximity

Land Use Planning

Problems with mobility-focused planning



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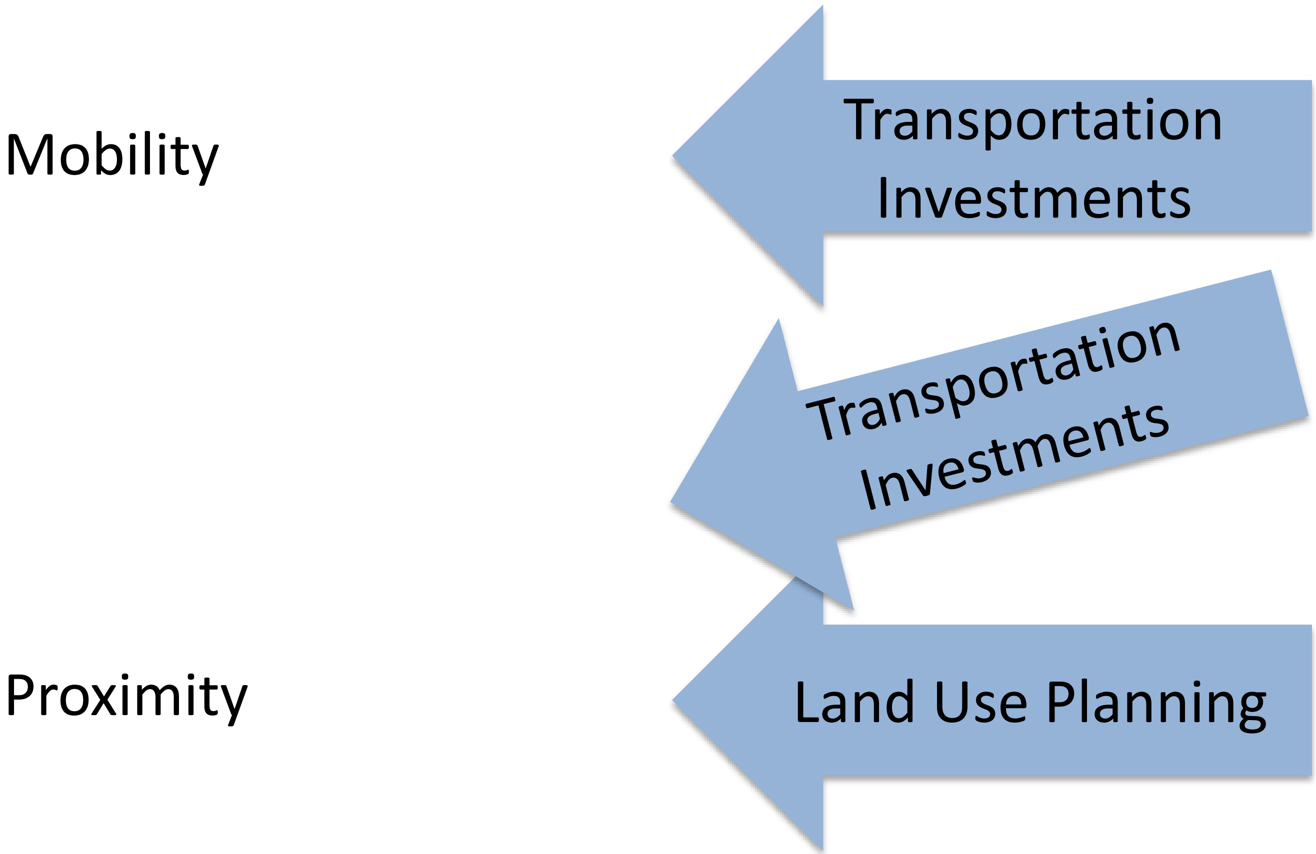

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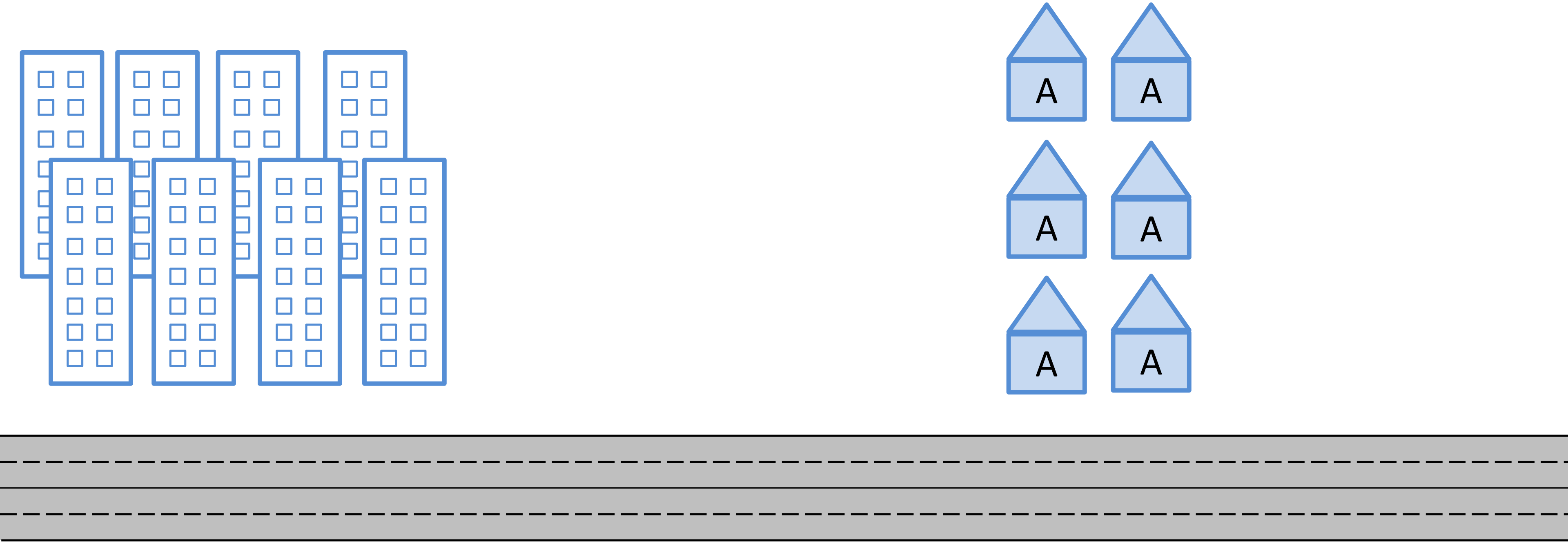
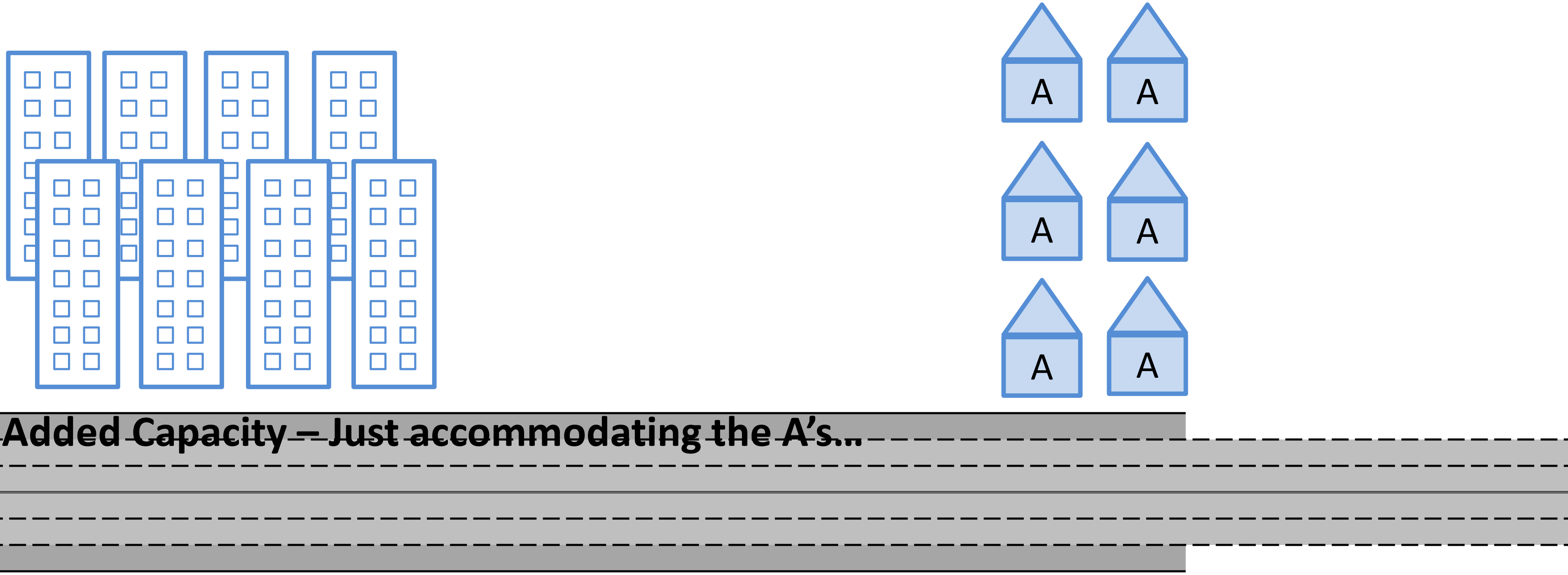


Problems with mobility-focused planning



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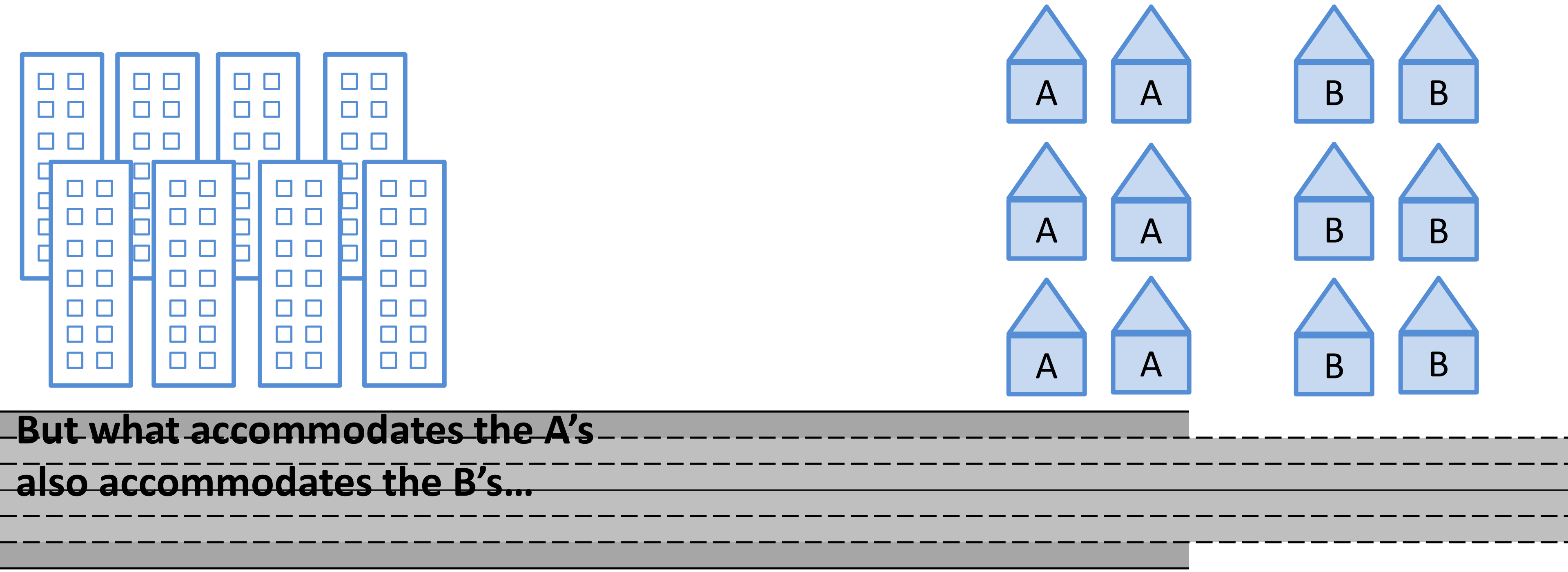

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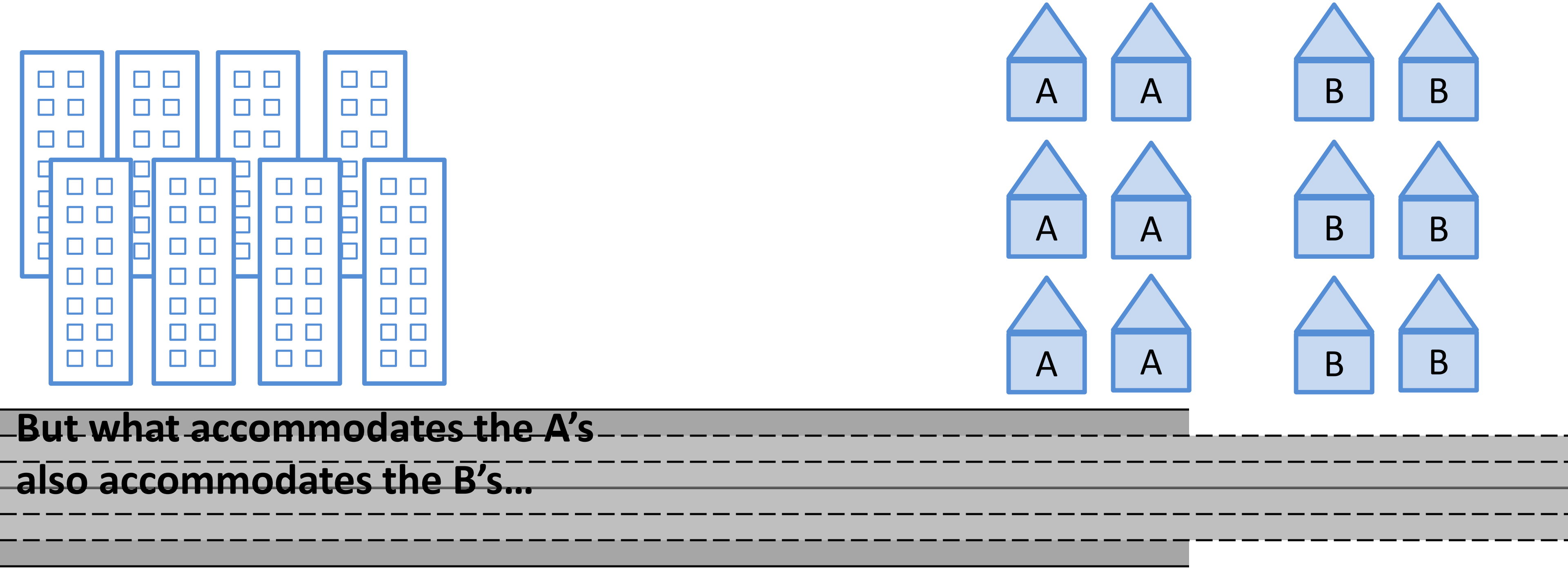
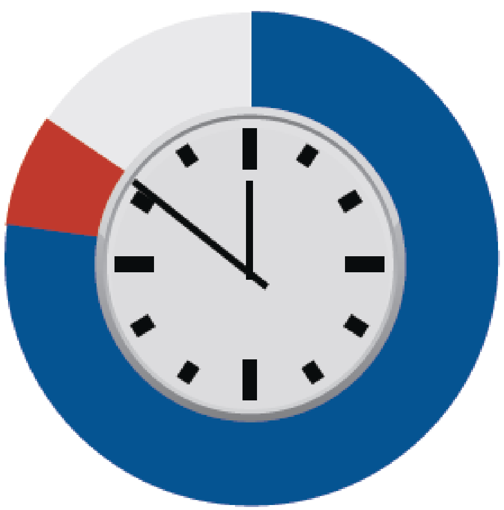
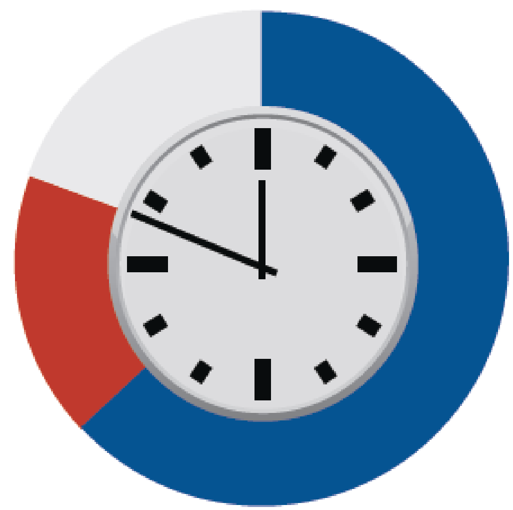


Traffic re-congests until it finds the equilibrium delay

Problems with mobility-focused planning

Denver 1982		Denver 2007
1.09	Travel Time Index	1.31
50.6 minutes	Average travel time	49.6 minutes
46.4 mins	Travel time without traffic	37.9 minutes
4.2 mins	Extra rush hour delay	11.7 minutes





Distinguishing Performance measures from measures of impact

What do we want from transportation?

- **Provide access to destinations**
  - **Economic opportunity**
  - **Social opportunity**

What do we want from transportation?

- Provide access to destinations
  - Economic opportunity
  - Social opportunity

- **Minimize other harm**
  - **Environment**
  - **Health**

- **Maximize other benefit**
  - **Health (e.g. active transport)**

- **Minimize cost**
  - **Public**
  - **Private**

What do we want from transportation?

- Provide access to destinations
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Performance Measures

- Minimize other harm
  - Environment
  - Health

Measures of Impact

- Maximize other benefit
  - Health (e.g. active transport)
- Minimize cost
  - Public
  - Private

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Measures of Impact

CEQA

Greenhouse Gas Emissions

Greenhouse Gasses

Transportation's Share of Total CA GHGs

- Tailpipe emissions: 38%
- Incl. petroleum refining: ~ half
- Incl. roadway construction and maintenance vehicle manufacture: > half

Targets

- 1990 levels by 2020 (AB 32)
- 40% reduction by 2030 (EO B-30-15)
- 80% reduction by 2050 (EO S-3-05)
- 80% reduction *from transportation* by 2050 (EO B-16-12)

Greenhouse Gasses

Ways to reduce transportation GHGs:

- Vehicle Efficiency
- Fuel Carbon Content
- VMT

2030, 2050 Goals Very Challenging

VMT Reduction

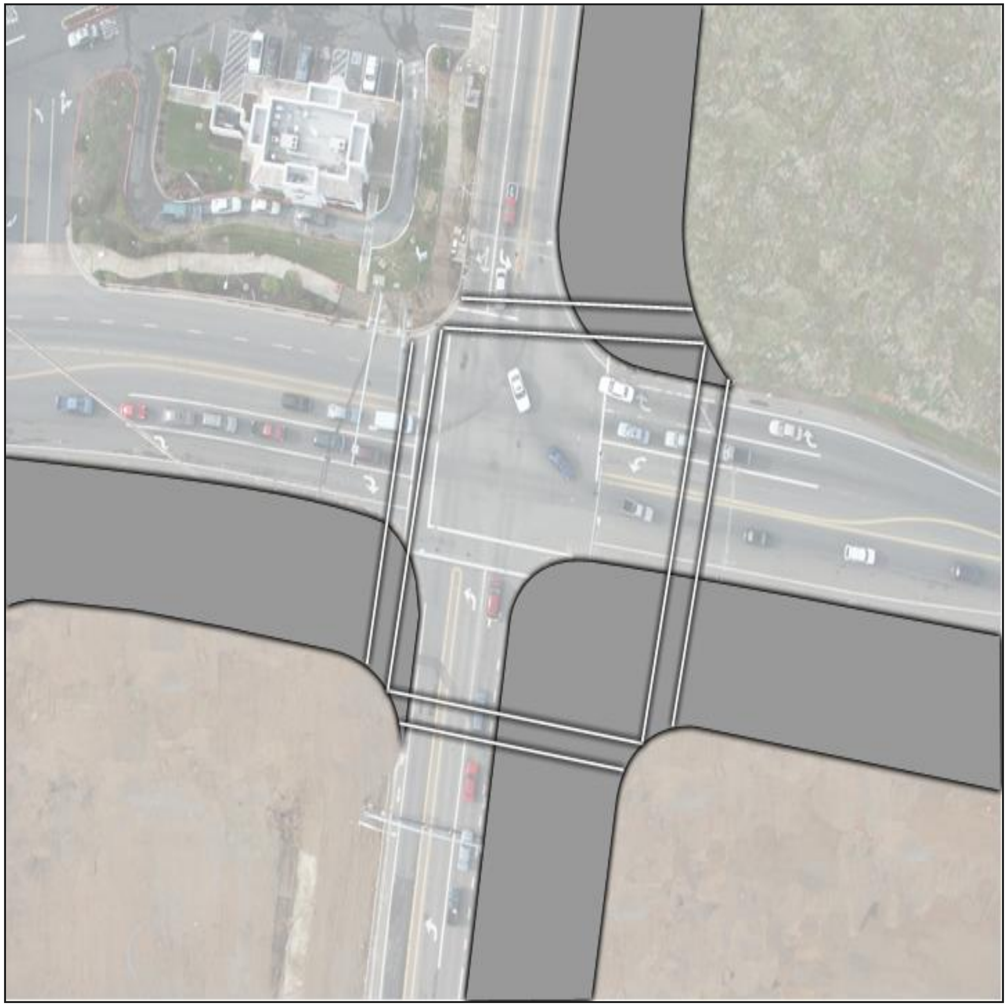
- SB 375
- SB 391
- Infill Priority (AB 857)
- CEQA

Problems with using LOS in CEQA

Transportation Analyses in CEQA

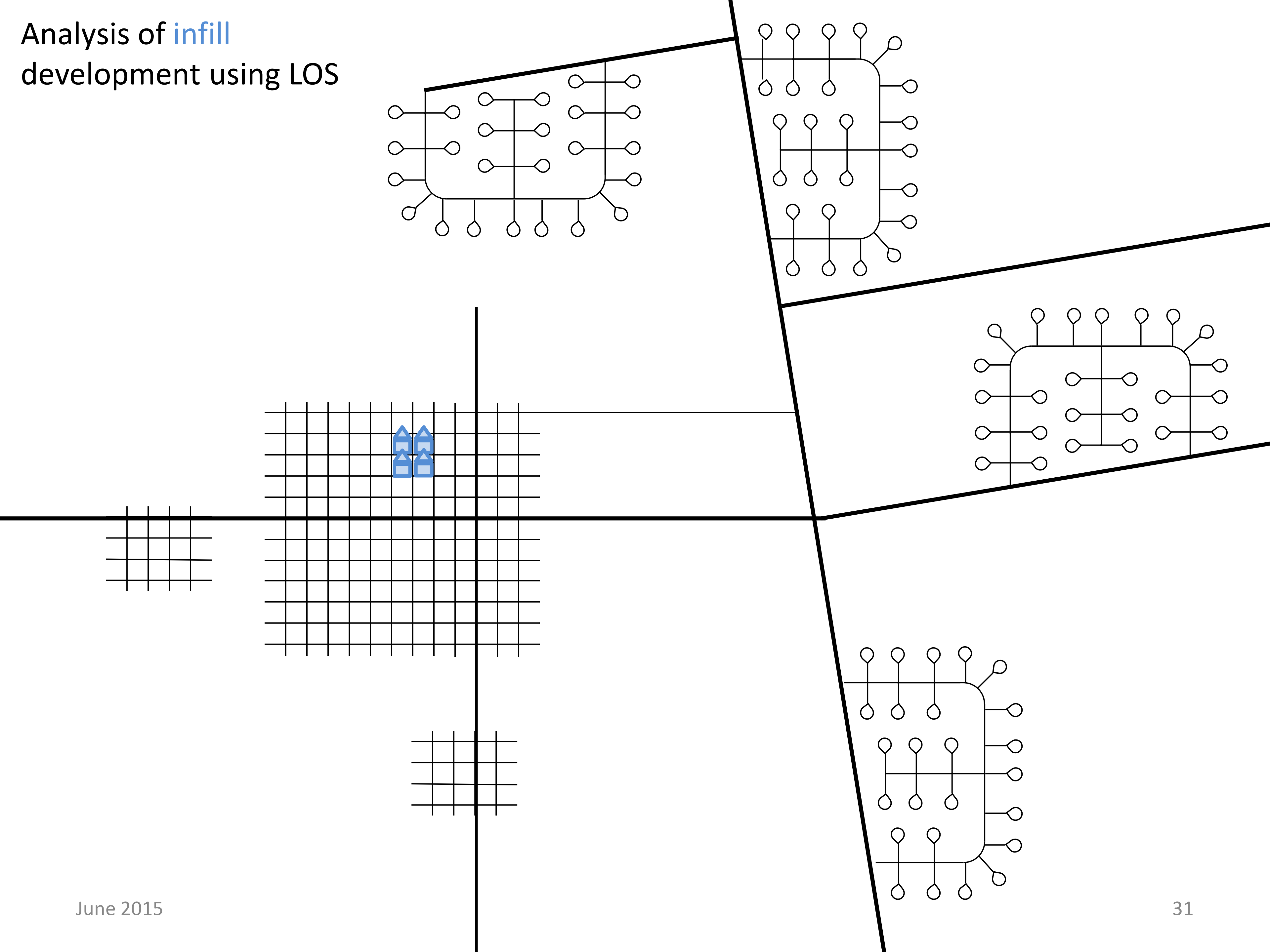
California Environmental Quality Act

Metric of Transportation Impact: Automobile Level of Service Standards (LOS)



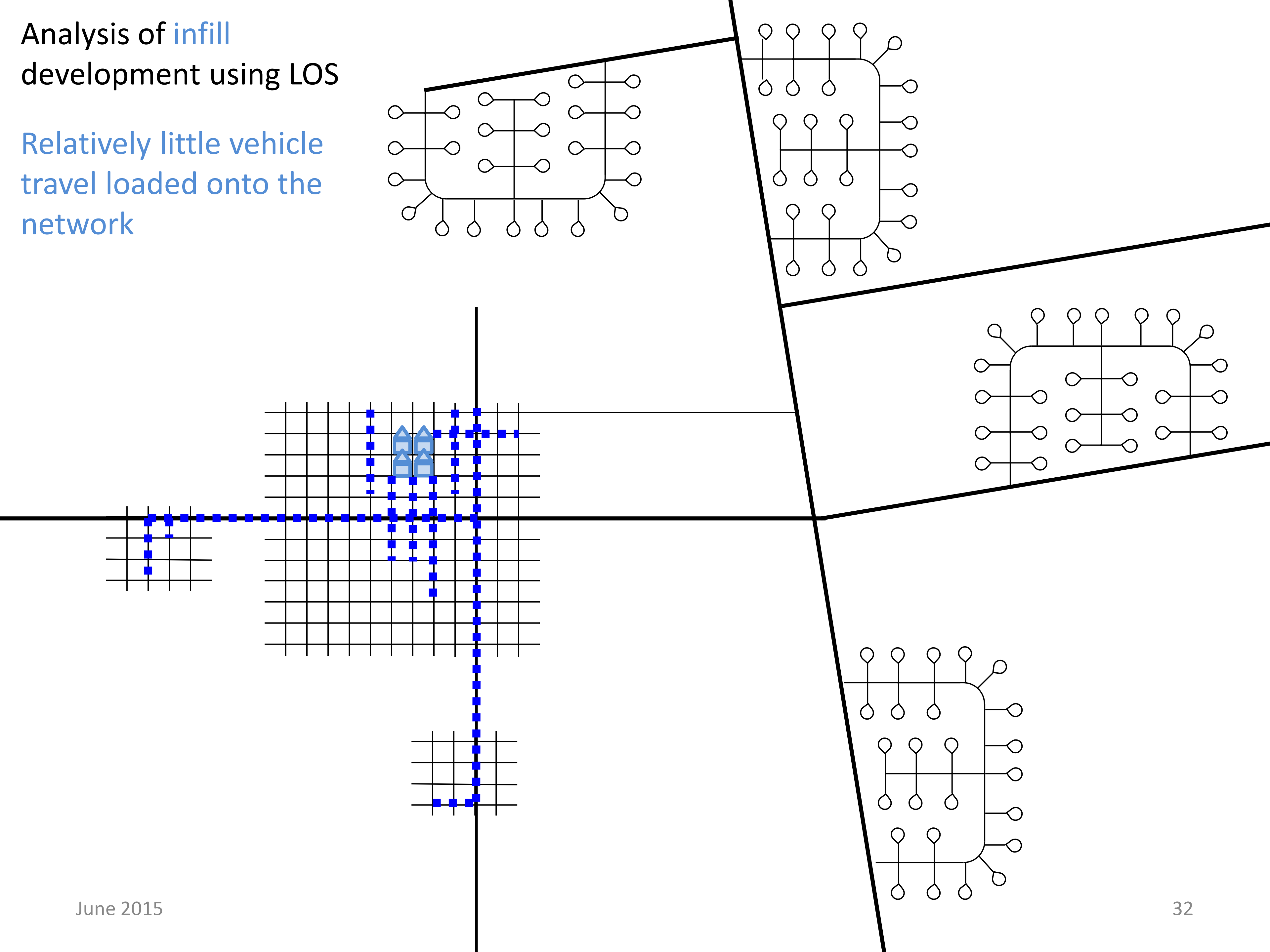
Source: Fehr and Peers

Analysis of infill development using LOS



Analysis of infill development using LOS

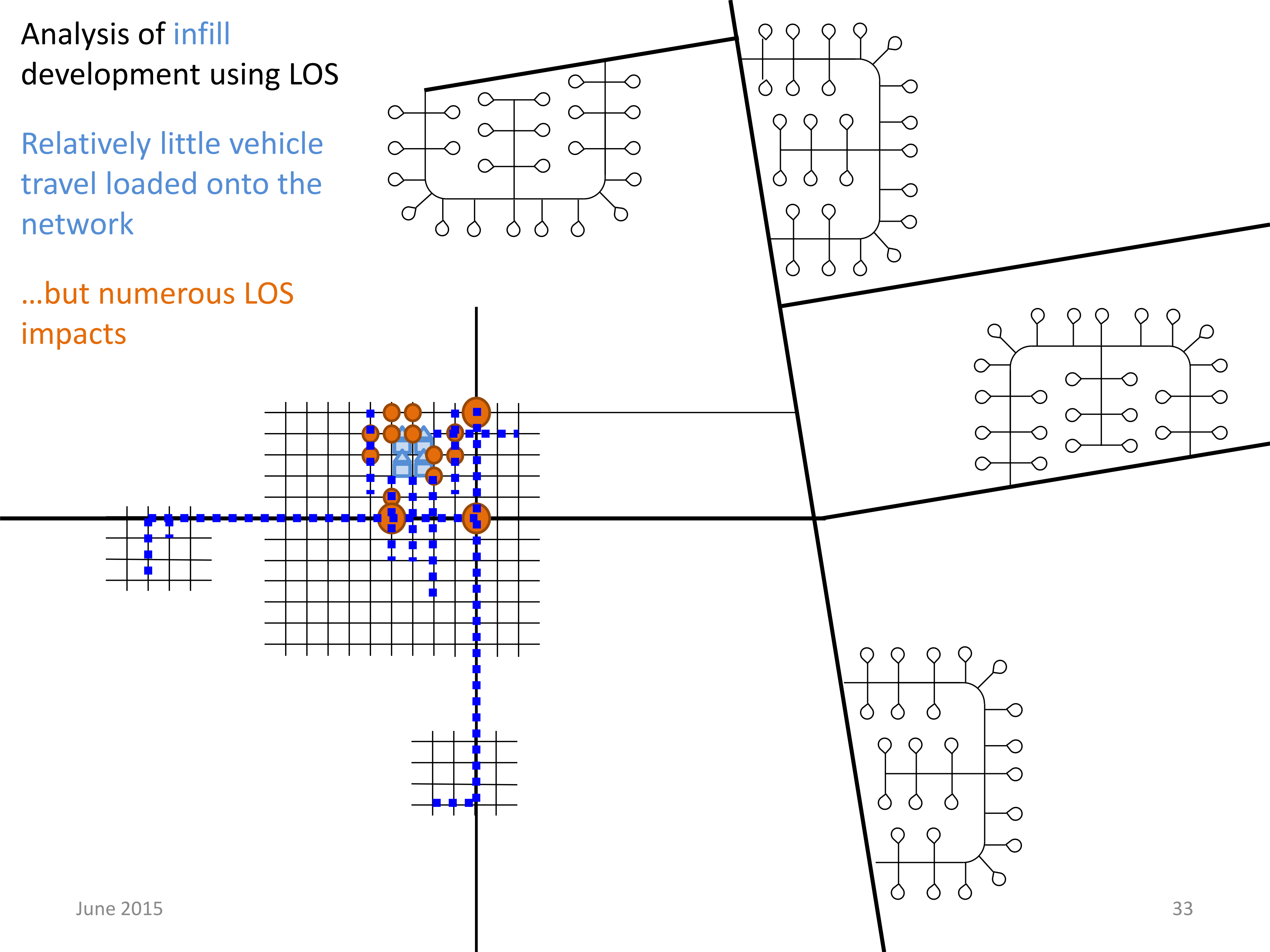
Relatively little vehicle travel loaded onto the network



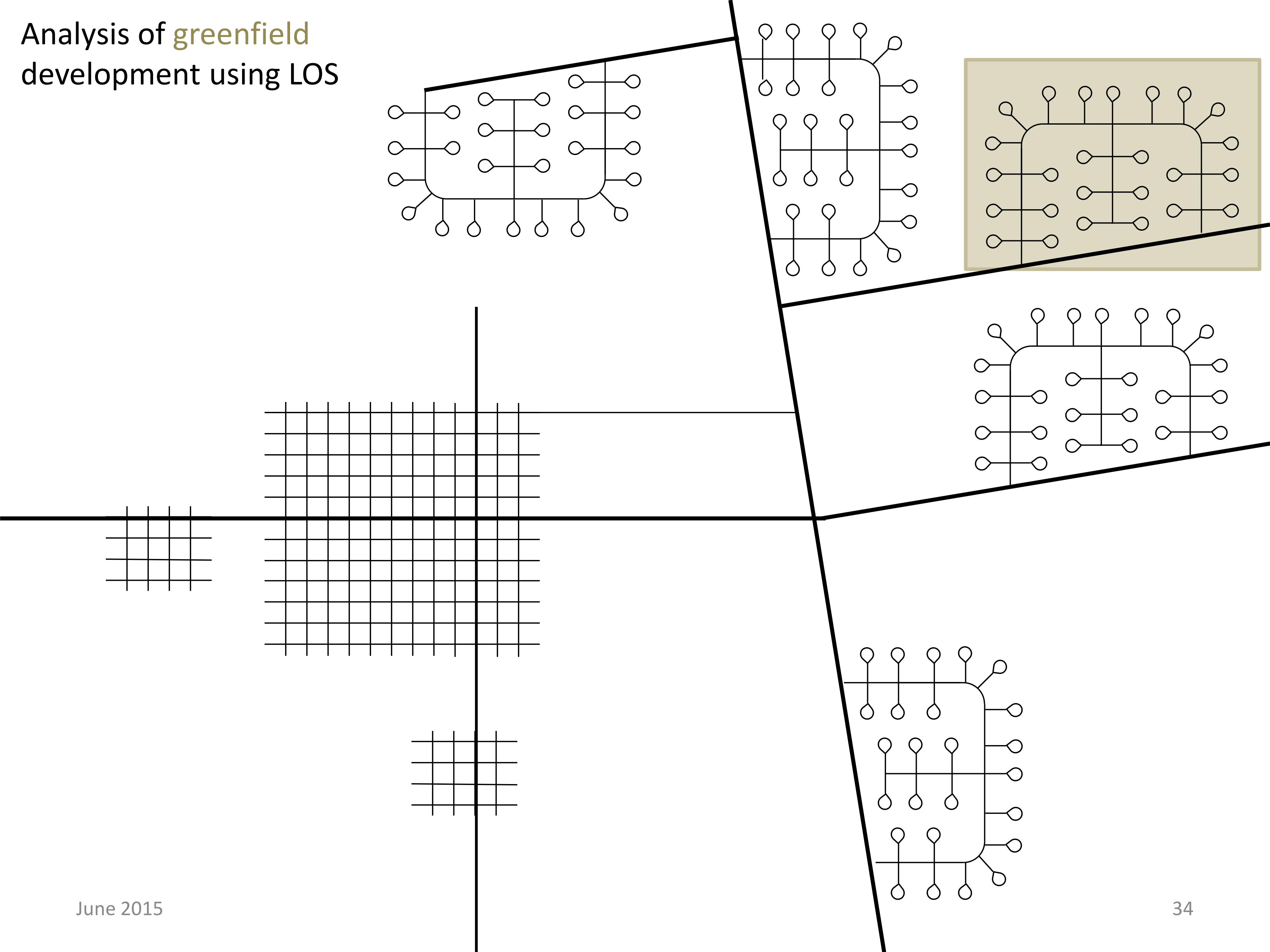
Analysis of infill development using LOS

Relatively little vehicle travel loaded onto the network

…but numerous LOS impacts

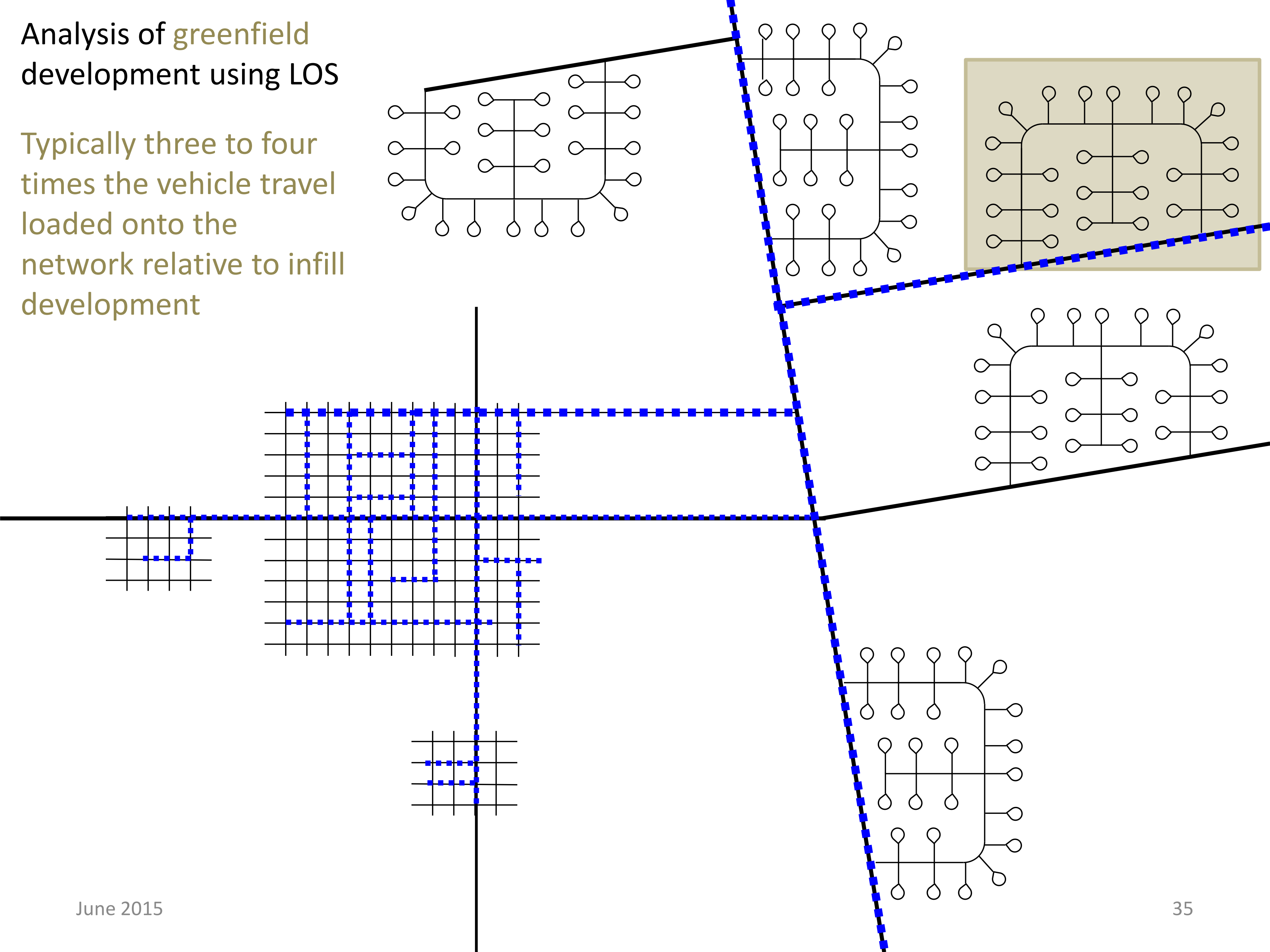


Analysis of greenfield development using LOS



Analysis of greenfield development using LOS

Typically three to four times the vehicle travel loaded onto the network relative to infill development



Analysis of greenfield development using LOS

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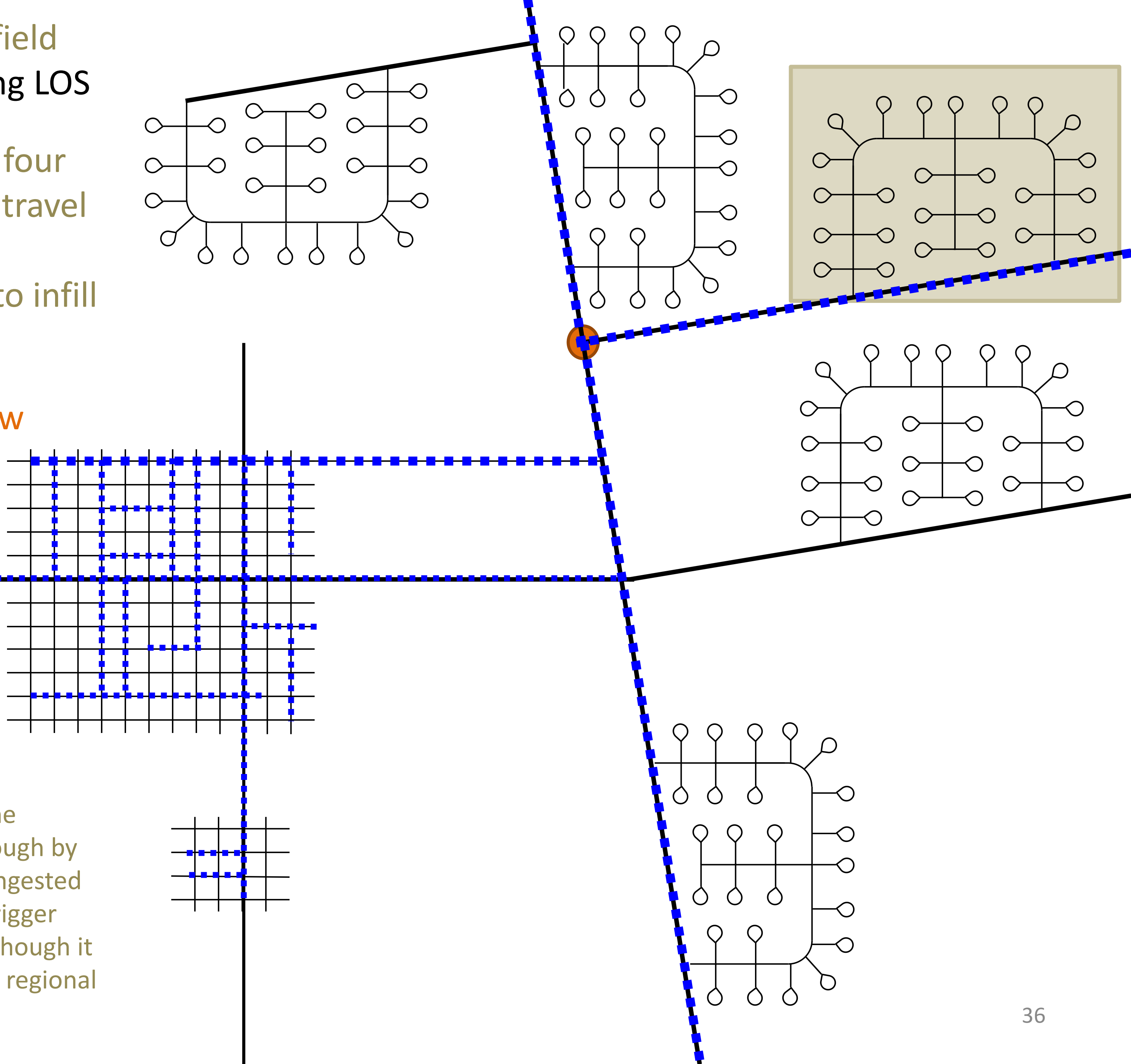
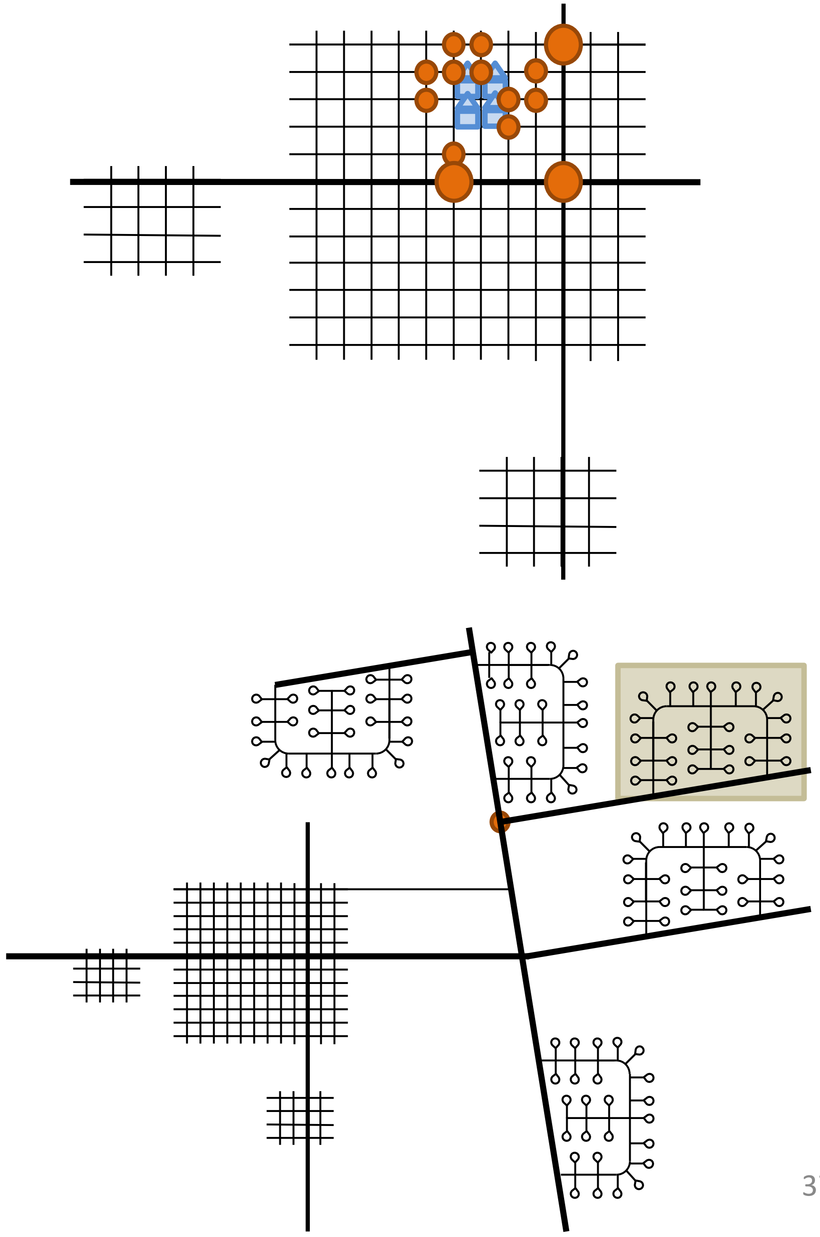
…but relatively few LOS impacts



Traffic generated by the project is disperse enough by the time it reaches congested areas that it doesn't trigger LOS thresholds, even though it contributes broadly to regional congestion

Problems with LOS as a Measure of Transportation Impact

1. **Punishes last-in, inhibits infill, pushes development outward**
2. “Solves” local congestion, exacerbates regional congestion
3. Inhibits transit
4. Inhibits active transport
5. Measures mobility, not access; shows failure when we succeed
6. Measures mobility poorly; fails to optimize network even for autos
7. Forces more road construction than we can afford to maintain
8. Hard to calculate and inaccurate



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David Paul Morris / SFC

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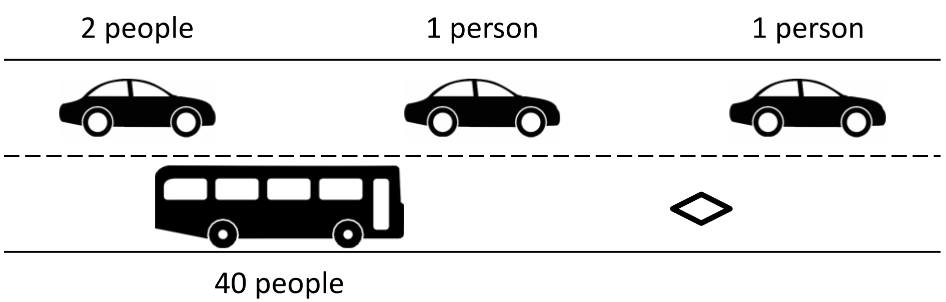

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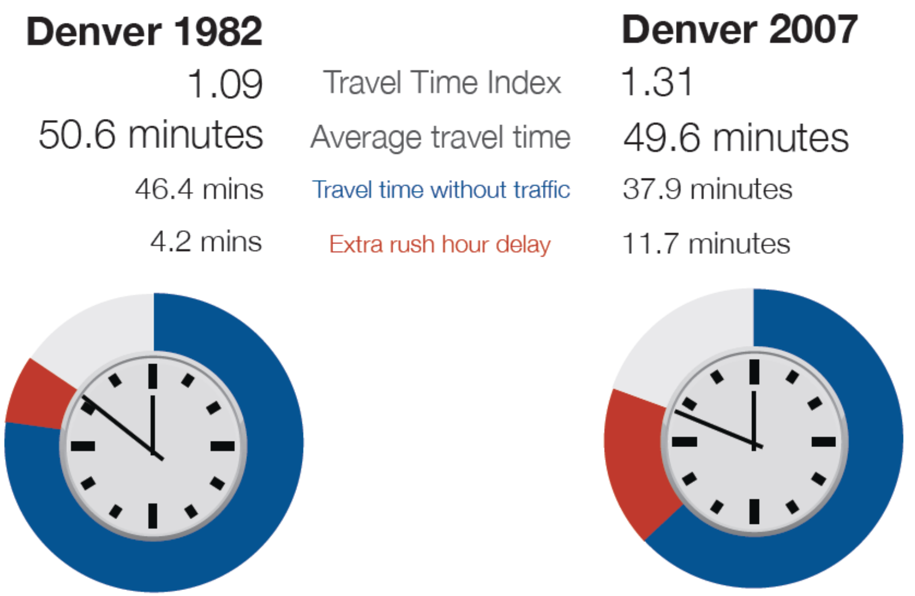

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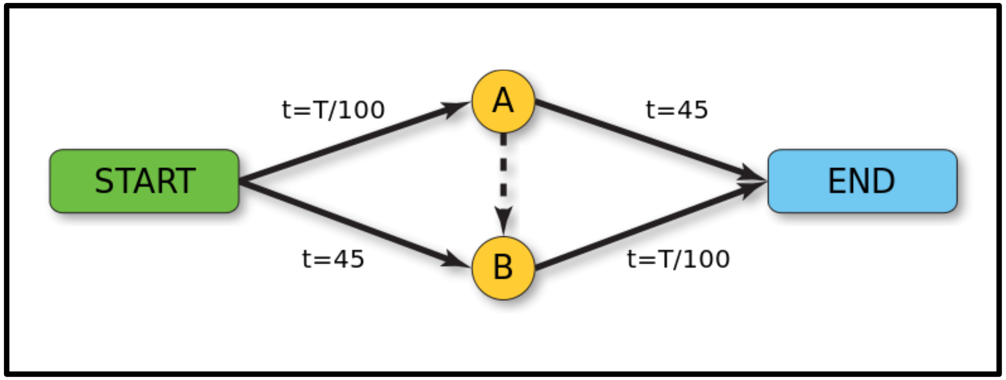

Braess’s Paradox

Problems with LOS as a Measure of Transportation Impact

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8. **Hard to calculate and inaccurate**

Table V.M-13
Intersection Critical Movement Analysis (CMA) and Level of Service (LOS) Summary
Existing (2001) and Future (2005) Conditions

No.	Intersection	Peak Hour	Existing CMA	Existing LOS	Without Project CMA	Without Project LOS	With Project CMA	With Project LOS	With Project Impact	With Project + Mitigation CMA	With Project + Mitigation LOS	With Project + Mitigation Impact
1.	Sunset Boulevard &	AM	0.894	D	1.038	F	1.037	F	-0.001	1.036	F	-0.002
	Beverly Glen Boulevard (E.)	PM	1.023	F	1.225	F	1.216	F	-0.009	1.215	F	-0.010
2.	Sunset Boulevard &	AM	1.189	F	1.385	F	1.388	F	0.003	1.385	F	0.000
	Beverly Glen Boulevard (W.)	PM	1.062	F	1.264	F	1.251	F	-0.013	1.249	F	-0.015
3.	Wilshire Boulevard &	AM	0.868	D	1.030	F	1.030	F	0.000	1.029	F	-0.001
	Beverly Glen Boulevard	PM	0.884	D	1.140	F	1.133	F	-0.007	1.133	F	-0.007
4.	Santa Monica Boulevard (N.) &	AM	0.861	D	1.076	F	1.080	F	0.004	1.078	F	0.002
	Overland Avenue	PM	0.814	D	1.082	F	1.054	F	-0.028	1.054	F	-0.028
5.	Santa Monica Boulevard (S.) &	AM	0.478	A	0.358	A	0.358	A	0.000	0.358	A	0.000
	Overland Avenue	PM	0.428	A	0.465	A	0.465	A	0.000	0.465	A	0.000
6.	Santa Monica Boulevard (N.) &	AM	0.849	D	1.099	F	1.107	F	0.008	1.104	F	0.005
	Beverly Glen Boulevard	PM	0.823	D	1.139	F	1.130	F	-0.009	1.128	F	-0.011
7.	Santa Monica Boulevard (S.) &	AM	0.849	D	0.464	A	0.464	A	0.000	0.464	A	0.000
	Beverly Glen Boulevard	PM	0.884	D	0.575	A	0.575	A	0.000	0.575	A	0.000
8.	Santa Monica Boulevard (S.) &	AM	0.325	A	1.006	F	1.007	F	0.001	1.005	F	-0.001
	Century Park West	PM	0.397	A	0.984	E	0.969	E	-0.015	0.966	E	-0.018
9.	Santa Monica Boulevard (N.) &	AM	0.613	B	0.213	A	0.213	A	0.000	0.213	A	0.000
	Club View Drive	PM	0.707	C	0.408	A	0.408	A	0.000	0.408	A	0.000
10.	Santa Monica Boulevard (N.) &	AM	0.825	D	1.191	F	1.205	F	0.014 *	1.199	F	0.008
	Avenue Of The Stars	PM	0.755	C	0.967	E	0.956	E	-0.011	0.955	E	-0.012
11.	Santa Monica Boulevard (S.) &	AM	0.506	A	NA		NA			NA		
	Avenue Of The Stars	PM	0.544	A	NA		NA			NA		
12.	Santa Monica Boulevard (N.) &	AM	0.759	C	0.950	E	0.955	E	0.005	0.953	E	0.003
	Century Park East	PM	0.666	B	0.846	D	0.805	D	-0.041	0.804	D	-0.042
13.	Santa Monica Boulevard (S.) &	AM	0.771	C	NA		NA			NA		
	Century Park East	PM	0.648	B	NA		NA			NA		
14.	Santa Monica Boulevard (N.) &	AM	1.096	F	1.261	F	1.263	F	0.002	1.263	F	0.002
	Wilshire Boulevard	PM	1.046	F	1.294	F	1.288	F	-0.006	1.287	F	-0.007

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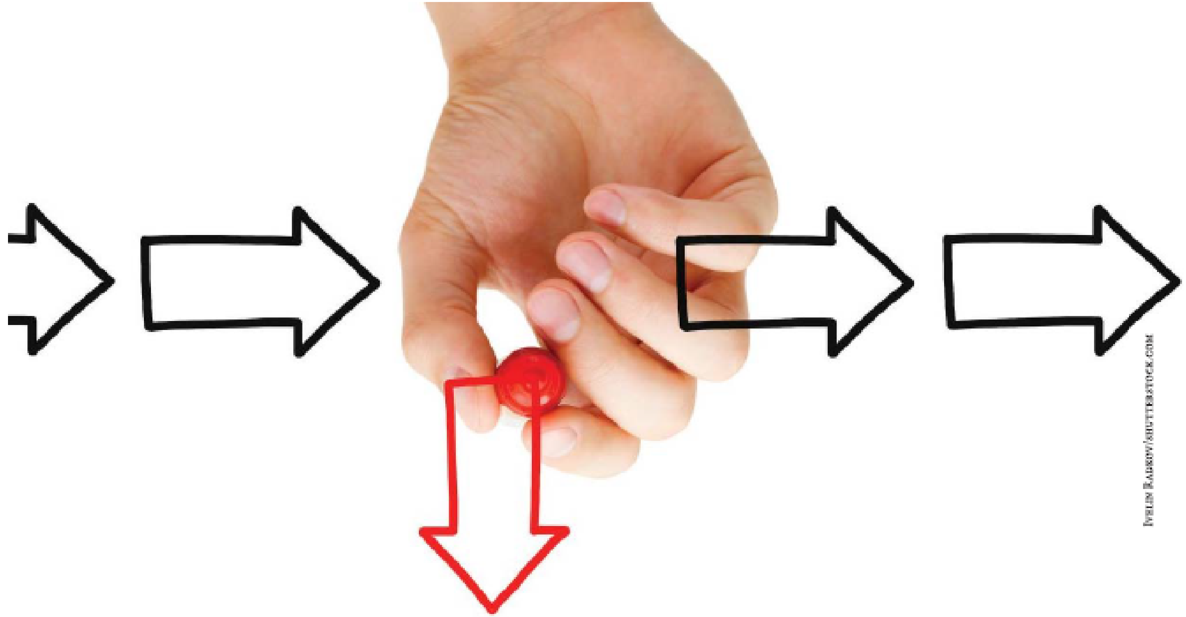
ITE Journal
May 2014



Changing the Paradigm of Traffic Impact Studies:

How Typical Traffic Studies Inhibit Sustainable Transportation

> **"The practice of focusing on automobile level of service (LOS) and traffic flow as part of environmental clearance has, ironically, actually inhibited sustainable transportation"**

tation, that is, transit, bicycling, and walking. This paper describes the problems with current practices and suggests how transportation studies should be used to improve mobility and livability for all.

feature

ITE Jo… Aug 20…

“Three implicit assumptions [in the use of LOS]:

1. Cars are more important than people
2. We should provide roadway capacity in excess of what is actually needed
3. New development should occur in suburban and exurban locations, rather than in established areas”

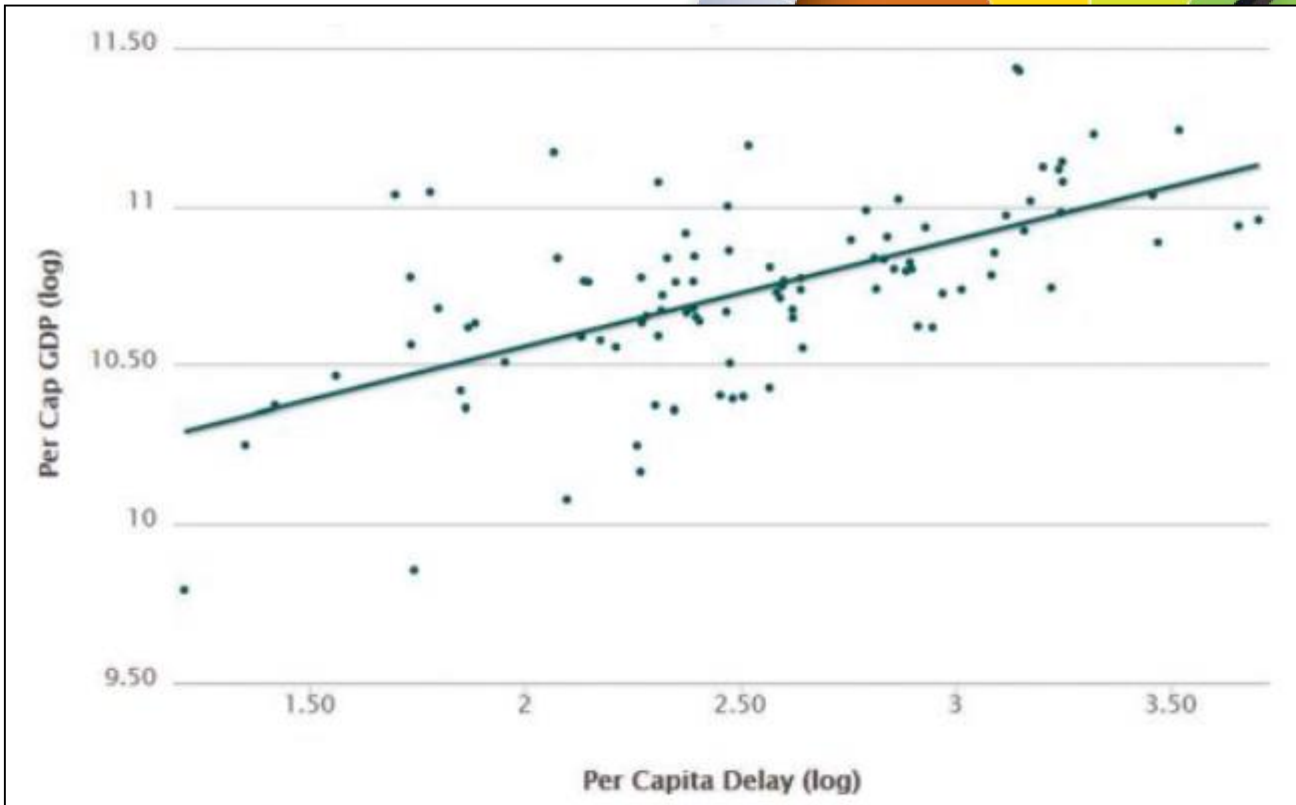


Figure 1: The Relationship between Traffic Delay and GDP in American Metros[6]

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SB 743 and the shift to VMT

SB 743

- Prohibits the use of LOS in CEQA
  - Clarifies: auto delay ≠ env. impact
- Directs OPR to replace it with a metric that:
  1. Reduces GHGs
  2. Improves multimodal network
  3. Increases mixed use development
- OPR Implementation
  - Preliminary Evaluation of Alternative Transportation Metrics
  - Consensus on Vehicle Miles Travel (VMT)

Benefits of VMT as a Measure of Transportation Impact

1. Removes barriers to infill
2. Easier to model
3. Already used (e.g. for GHGs)
4. More accurate
5. Sees the big picture
6. Mitigation doesn’t undo itself by inducing more car travel
7. Mitigation reduces long run maintenance burden
8. Mitigation forwards other environmental and human health factors

Impacts of High VMT Development

Environment

- Emissions
  - GHG
  - Regional pollutants
- Energy use
  - Transportation energy
  - Building energy
- Water
  - Water use
  - Runoff – flooding
  - Runoff – pollution
- Consumption of open space
  - Sensitive habitat
  - Agricultural land

Health

- Collisions
- Physical activity
- Emissions
  - GHGs
  - Regional pollutants
- Mental health

Cost

- Increased costs to state and local government
  - Roads
  - Other infrastructure
  - Schools
  - Services
- Increased private transportation cost
- Increased building costs (due to parking costs)
- Reduced productivity per acre due to parking
- Housing supply/demand mismatch → future blight

Implementation of VMT: Geography/Extent

Urban

- Lots of mitigation options, greatest *percent* VMT reduction
- VMT reduction benefits environment, health, cost here
- Streamline infill, transit, active transportation projects

Suburban

- Many mitigation options; greatest *absolute* VMT reduction
- VMT reduction benefits environment, health, cost here too

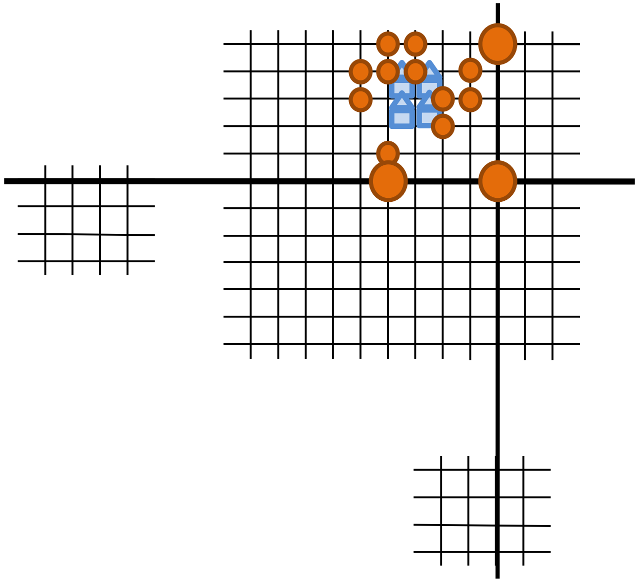
Rural

- Many mitigation options at the plan level, some at the project level
- Reducing VMT benefits environment, health, cost here too
- VMT mitigation helps maintain small town character, equity

Implementation: Land Use Projects

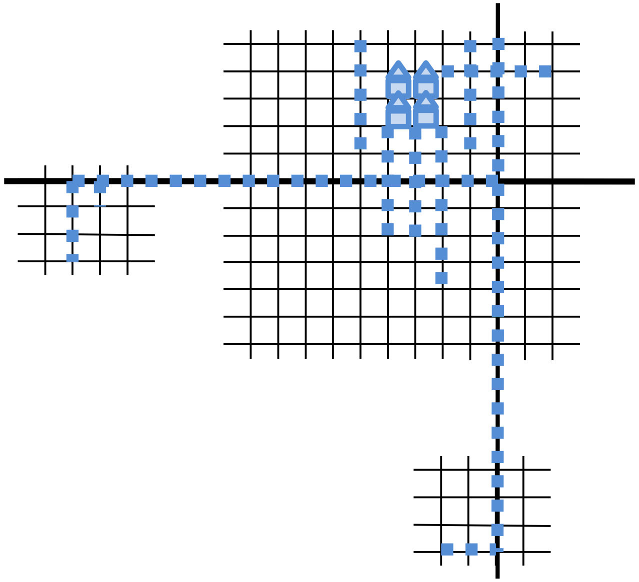
Old:

Analyze nearby intersections; if impact, add auto capacity or reduce project size



New:

VMT loaded onto the roadway network; if impact, adjust project to be more travel efficient (e.g. add TDM) or pay into VMT-reducing mitigation program



Implementation: Transit and Active Transport Projects

Old: Transit, active transportation projects slow automobile traffic, trigger LOS-based "impact to transportation"

New: Transit, active transportation presumed to reduce VMT unless demonstrated otherwise

Implementation: Roadway Expansion Projects

Old: Widen nearby intersections from rerouted/induced vehicle travel to mitigate LOS impacts; Induced VMT analysis required for GHG calculation

New: Estimate induced VMT; solution is to manage lanes, deploy ITS, or provide TDM

Implementation: Roadway Expansion Projects

Roadway expansion reduces travel time, which leads to:

1. Longer trips (↑ VMT)
2. Mode shift toward automobile (↑ VMT)
3. Newly generated trips (↑ VMT)
4. Route changes (can ↑ or ↓ or VMT)
5. More disperse land use development (↑ VMT)

All the result of basic supply and demand

Implementation: Roadway Expansion Projects

Empirical Study

- 20 academic studies quantify induced vehicle travel
- Long-run elasticities typically 0.6 to 1.0
- Recent California Air Resources Board Assessment:
  - Policy Brief
    http://www.arb.ca.gov/cc/sb375/policies/hwycapacity/highway_capacity_brief-4-21-14.pdf
  - Background Technical Document
    http://www.arb.ca.gov/cc/sb375/policies/hwycapacity/highway_capacity_bkgd-4-21-14.pdf
  - ARB declares literature review “Highest Confidence” for induced travel research

Implementation: Roadway Expansion Projects

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Implementation: Roadway Expansion Projects

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Implementation: Roadway Expansion Projects

<u>How to estimate induced VMT</u>

A travel demand model can estimate:

1. Longer trips
2. Mode shift toward automobile
3. Newly generated trips [in some cases]
4. Route changes

But not:

5. Land use changes

Implementation: Roadway Expansion Projects

How to estimate land use change (and VMT implications):

- Employ a land use model
- Employ an expert panel, e.g. using Delphi method
- Examine gap between modeled and typical empirical results; adjust and/or explain model results

Caltrans role in implementing SB 743

Caltrans’ Role in Implementing SB 743

1. Rethinking approach on mitigating impacts to the state highway system

2. Measuring the effects of transportation investments

3. Developing the tools and models, undertaking research

Caltrans' Role in Implementing SB 743

1. **Rethinking approach on mitigating impacts to the state highway system**

Opportunity:

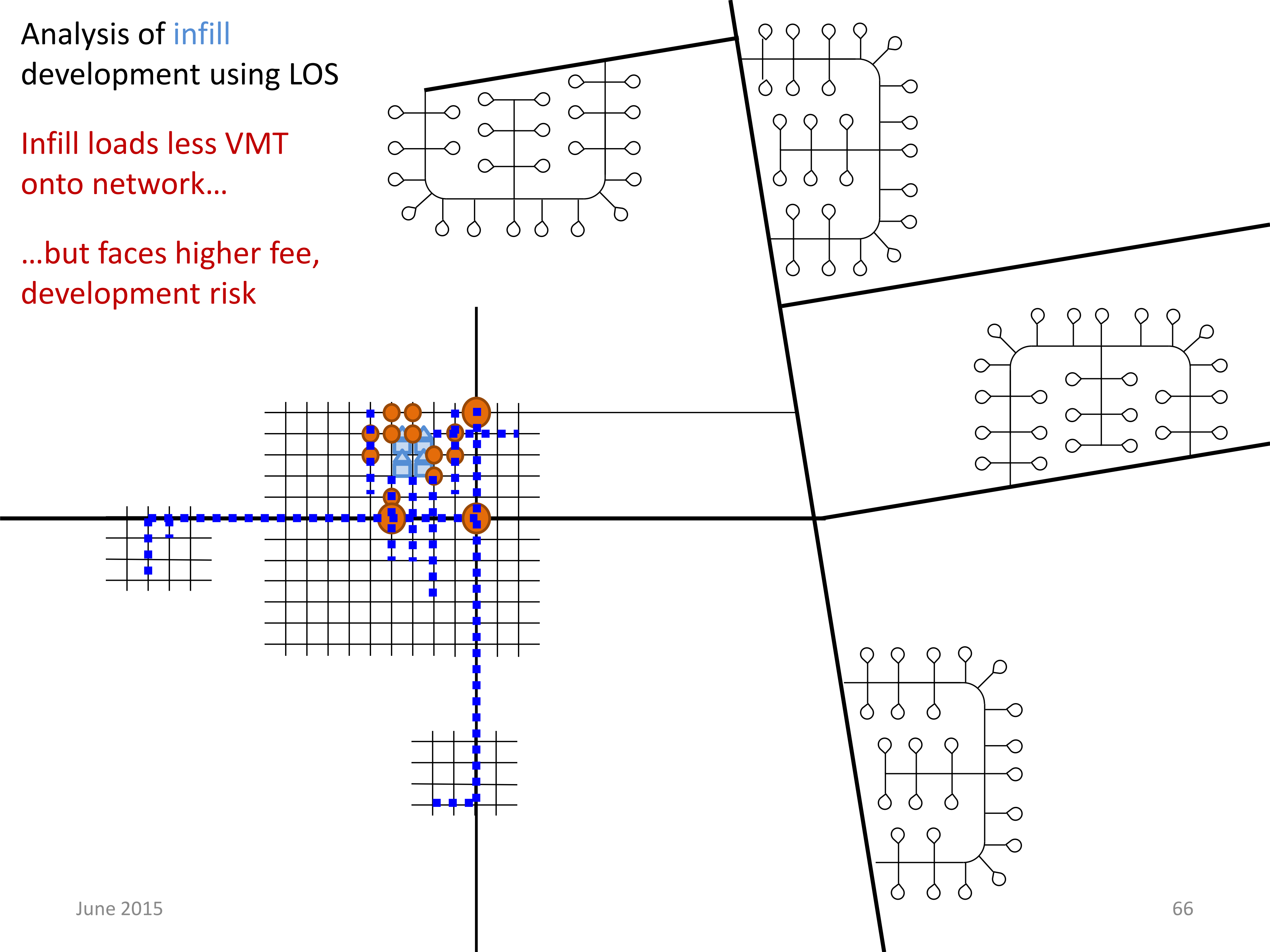
- Better, less costly solutions
- Improve *Access to Destinations*

E.g. shifting cost and risk burden away from infill development

Analysis of infill development using LOS

Infill loads less VMT onto network…

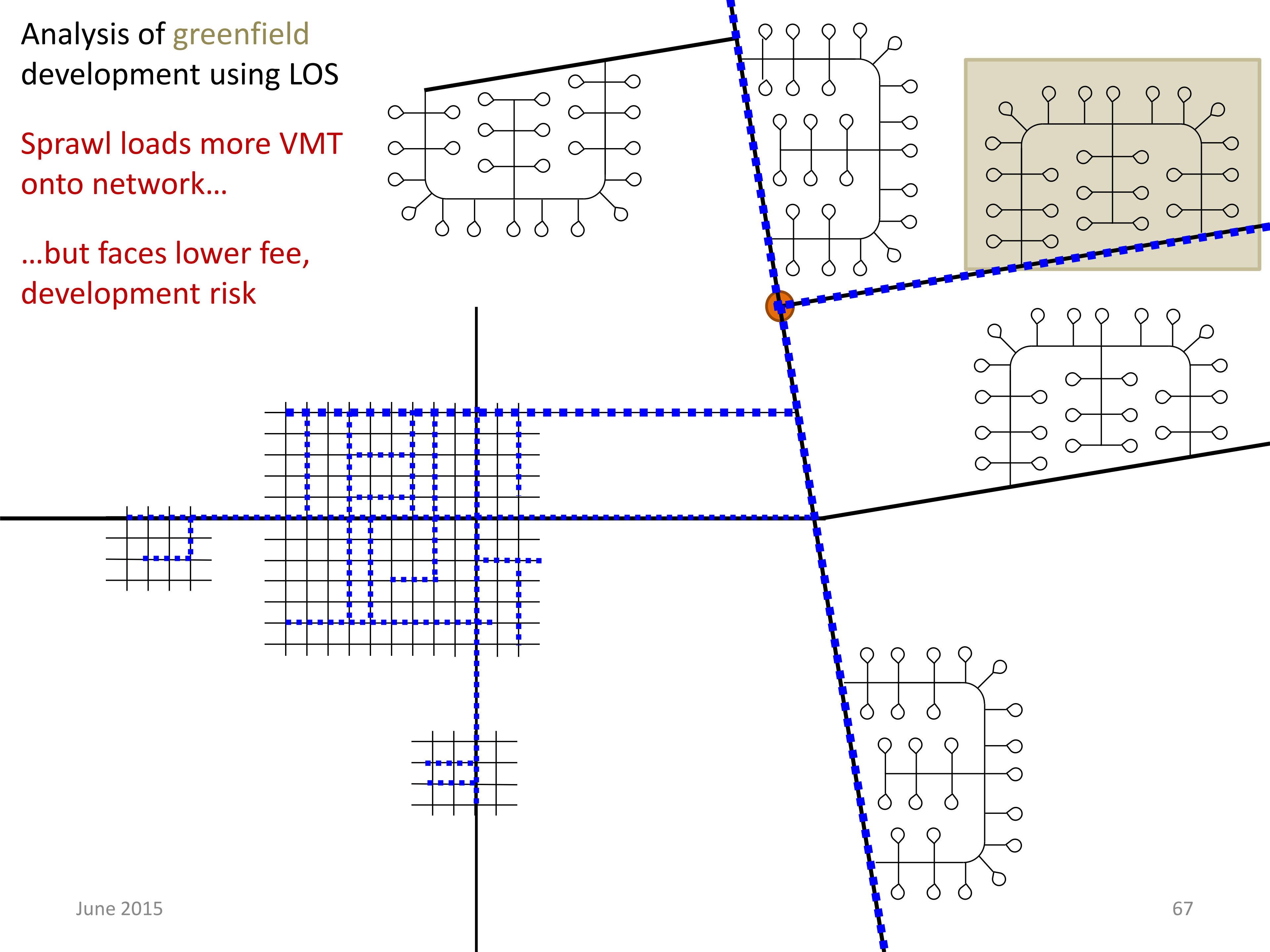
…but faces higher fee, development risk



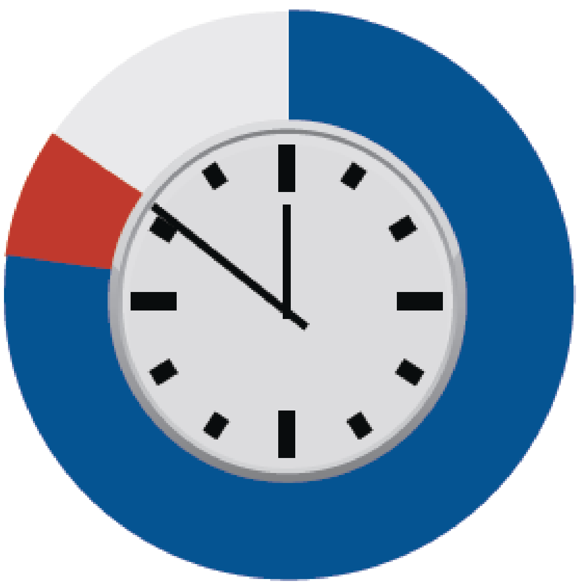
Analysis of greenfield development using LOS

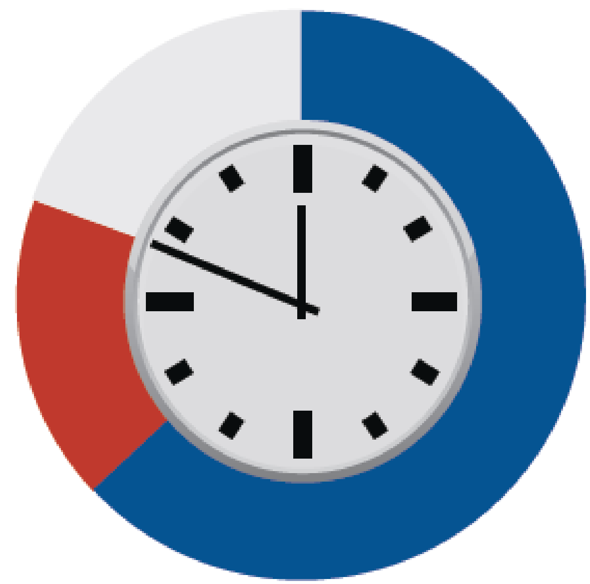
Sprawl loads more VMT onto network…

…but faces lower fee, development risk



Denver 1982		Denver 2007
1.09	Travel Time Index	1.31
50.6 minutes	Average travel time	49.6 minutes
46.4 mins	Travel time without traffic	37.9 minutes
4.2 mins	Extra rush hour delay	11.7 minutes





Caltrans' Role in Implementing SB 743

1. Rethinking approach on mitigating impacts to the state highway system

Pathways:

- Develop VMT-based impact fee program
- Develop improved analysis capabilities, and/or…
- Improve coordination with local and regional entities

Venues:

- OPR – CalSTA – Caltrans working group
- TAG-**TISG**
    - Interim guidance
    - Full guidance

Caltrans' Role in Implementing SB 743

2. Measuring the effects of transportation investments

Opportunity:

- Improve legal adequacy of CEQA documents
- Accurate estimates of traffic outcomes of projects
- Accurate estimates of GHG outcomes of projects
- Accurate estimates of other environmental outcomes of projects

Venues:

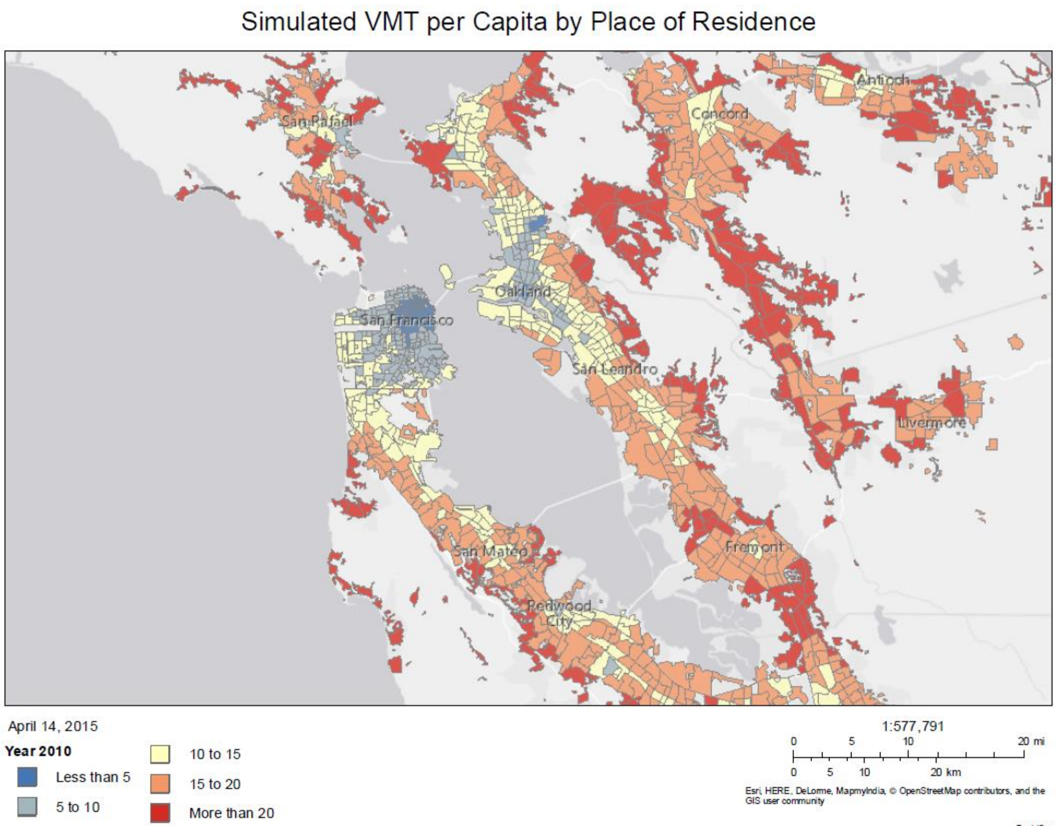
- OPR – CalSTA – Caltrans working group
- **TAG**-TISG
- Coordination between CEQA Guidelines and Caltrans Guidelines

Caltrans' Role in Implementing SB 743

3. Developing the tools and models, undertaking research

Example:

- California Statewide Travel Demand Model



Caltrans' Role in Implementing SB 743

$Billions in transportation investments → $Trillions in land use investments

Thanks!

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